

# Learning in technology-enhanced medical simulation: locations and knowings

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## How learning takes place during a simulation?

The use of simulators has become a common teaching strategy in medical education. It is seen as offering opportunities to address the needs for training interprofessional collaboration by focusing on communication, situation awareness, decision making and coping with stress [1, 2]. While there is a large body of quantitative effect studies supporting the use of technology-enhanced simulations in medical training [3], there is a lack of rigorous, theory-based, qualitative studies to clarify *how* and *when* to effectively use simulations to train health care professionals.

This qualitative study aims to investigate simulation-based medical training situations, focusing on performance, material arrangements and production of forms of knowing/learning.



## Method

The study comprised of observations of full-scale simulations (including briefing, simulation, observation and reflection) of acute trauma handling in the emergency room with 15 groups of medical and nursing students during winter 2012-13 at Health University, in Linköping, Sweden. A team of four educational researchers participated in observing the simulation training sessions and taking notes. Five of the sessions were also video-recorded.

## The three locations of simulation training



Simulation room



Observation room



Reflection room

**Three locations – different socio-material arrangements produce different kind of “doings” and thus different learning outcomes.**

## A socio-material approach: Actor-Network Theory

ANT regards the material and the natural as part of the social world. Rather than a single theory or a method, ANT is better characterised as a socio-material approach that focuses on the *associations* between human and nonhuman actors in our day-to-day practices [4, 5]. According to ANT “entities take their form and acquire their attributes as a result of their relations with other entities” [6]. This means that **humans and nonhumans exist as effects of these relations**, rather than as self-evident categories [6]. For example, the Sim-Man becomes performed as the *patient Sofia* in, by and through the socio-material relations that gather and are enacted into being during the simulation exercise. Further, objects and other nonhumans are seen as having **the capacity to ‘act’ by influencing states of affairs** through being entangled in networks with other actors.

Knowing and learning, according to ANT, are not simply cognitive or social phenomena, but are seen as emerging as effects of the socio-material networks gathered together and being performed into being in particular locations [7,8]. In this study we have focussed observing the socio-material arrangements that emerged in three locations – the simulation room, observation room and the reflection room - and analysing what kinds of knowing and learning they have produced through which socio-material arrangements. Our attention has been on the different “doings” taking place: what is happening here? Who and what participate in the doing? [cf. 9, 10] What are the effects of these socio-material gatherings in terms of learning and knowing?

	Simulation room	Control room	Reflection room
Action	“Doing”	Observing	Reflecting
Medical Knowing	Performance related to materiality of the Emergency room; Treating Sim-man as Sofia (acting “as if” was “as is”)	Discursive: simulation as material for discussion, observing and checking their medical knowledge. Teacher- student relation	Discursive & reflective : All events and experiences material for discussion - What happened? Why? What could we have done differently? What we have learned?
Affective knowing	Physically experienced: Dealing with stress and the emotional side of treating a patient in emergency work	Discursive: treating others’ emotions as theatre	Discursive & reflective: describing the emotions and sharing the experiences with others
Communication	Inter-professional between the nurses and the doctors and the senior doctor and the team	Teacher- student, or among students; Spontaneous and critical; Observation of the inter-professional communication “on-stage” and “back-stage”	Among students as colleagues; moderated by teachers; Professional, reflecting, constructive and controlled

## Discussion

- The different knowings exist in all three locations but are performed differently due to the changing socio-material arrangements
- All locations are important pedagogical spaces but nature of learning and learning outcomes are different
- Through the use of ANT as an approach on the arrangements of simulation-based medical education, it has been possible to show that participation and observation include different kinds of affordances respectively. These differences bring about different conditions for learning and produce different learning outcomes.
- These findings can contribute to more nuanced understandings of practice and knowing-in-practice, as well as a pedagogic knowledge related to simulation-based healthcare education.

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